



MEETING ABSTRACT

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The impact of the intestinal microbiome on human immune development and atopic disease

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From Canadian Society of Allergy and Clinical Immunology Annual Scientific Meeting 2013
Toronto, Canada. 3-6 October 2013

Background

Asthma is a chronic inflammatory disease characterized by bronchial hyper-responsiveness [1]. As the most endemic of all childhood diseases, asthma accounts for the majority of hospitalizations and school absences in children [2]. Exciting new research focuses on the involvement of the gut microbiome in asthma development. Murine studies support the hypothesis that the administration of probiotics or antibiotics during post-natal life alters the gut microbiome and ultimately the asthmatic symptoms of these mice [3-5]. This study will translate these findings into humans using stool samples obtained from the Canadian Healthy Infant Longitudinal Development (CHILD) study.

Hypothesis

The composition of the human gut microbiome in early life influences immune system development specifically related to asthma susceptibility, and specific microbial populations protect against or promote asthma development.

Methods

1262 children enrolled in the CHILD study with valid skin prick test and wheeze data (determined by questionnaire/clinical assessment) were grouped into four clinically relevant phenotypes: atopic wheeze, atopic non-wheeze, non-atopic wheeze, and non-atopic non-wheeze. Individuals who test positive for both wheeze and atopy are known to be at the highest risk for developing asthma versus those of the other three phenotypes [6,7]. 16S rDNA extracted and amplified from 3-month and 1-year stool samples of children in these four phenotypes was subjected to high

throughput Illumina sequencing to identify common/predominant microbial populations among these children during the first year of life. Principle coordinate analysis (PCoA) will be applied to compare the microbial taxa among the four phenotypes and assess the effect of confounding factors.

Results

PCoA will be used to compare the microbial populations among these four phenotypes. This analysis will be extended to examine the effects of confounding factors such as, mode of delivery, antibiotic exposure, feeding methods (breast milk vs. formula/solid food diet), and furred pet exposure on the gut microfloral diversity and composition relative to asthma development. These data will ultimately be compared alongside murine model data already established in the Finlay lab as well as with additional clinical data from the CHILD study regarding asthma/allergy development in these subjects at 3- and 5-years of age.

Conclusions

This study could potentially identify the gut microbiome as a therapeutic target to prevent the development of asthma in children, perhaps through the addition of specific probiotic regimens during the first year of life [4].

Published: 3 March 2014

References

1. Mazzarella G, Bianco A, Catena E, De Palma R, Abbate F: **Th1/Th2 lymphocyte polarization in asthma.** *Allergy* 2000, **55**(Suppl 61):6-9.
2. World Health Organization: **Asthma.** 2011.
3. Arnold IC, Dehzad N, Reuter S, Martin H, Becher B, Taube C, Muller A: **Helicobacter pylori infection prevents allergic asthma in mouse models through the induction of regulatory T cells.** *J Clin Invest* 2011, **121**:3088-3093.

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4. Forsythe P, Inman MD, Bienenstock J: **Lactobacillus reuteri inhibits the allergic airway response in mice.** *Am J Respir Crit Care Med* 2007, **175**:561-569.
5. Russell SL, Gold MJ, Hartmann M, Willing BP, Thorson L, Wlodarska M, Gill N, Blanchet MR, Mohn WW, McNagny KM, Finlay BB: **Early life antibiotic-driven changes in microbiota enhance susceptibility to allergic asthma.** *EMBO Rep* 2012, **13**:440-447.
6. Gong H: **Wheezing and Asthma.** In *Clinical Methods The History, Physical, and Laboratory Examinations*. 3 edition. Boston: Butterworths;Walker, H. K., Hall, W. D., Hurst, J. W. 1990; Ch. 37.
7. Rochetti R, Jesenak M, Rennerova Z, Barreto M, Ronchetti F, Villa MP: **Relationship between atopic asthma and the population prevalence rates for asthma or atopy in children: atopic and nonatopic asthma in epidemiology.** *Allergy Asthma Proc* 2009, **30**(1):55-63.

doi:10.1186/1710-1492-10-S1-A63

Cite this article as: Thomas *et al.*: The impact of the intestinal microbiome on human immune development and atopic disease. *Allergy, Asthma & Clinical Immunology* 2014 **10**(Suppl 1):A63.

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